

TIMOTHY W KOETH

University of Maryland
Institute for Research in Electronics and Applied Physics
1201U Energy Research Facility, Building 223
College Park, Maryland, 20742
(609) 577-8790 koeth@umd.edu

EDUCATION

Ph.D. in Physics, May 2009

Rutgers University - Rutgers College - New Brunswick, New Jersey

B.S. in Physics, August 1997

Rutgers University - Rutgers College - New Brunswick, New Jersey

RESEARCH INTERESTS

- Non-linear beam optics for intense charged particle beams
- Normal and superconducting radiofrequency (RF) cavities and associated High Level RF power systems
- Compact cyclotrons for educational, medical, and industrial applications
- Nuclear reactor physic & accelerator driven sub-critical systems
- In-lab didactic methods in the physical sciences

BIOGRAPHY Dr. Timothy W. Koeth has over fifteen years of technical and leadership experience in accelerator physics and engineering. He completed his doctoral work at Fermi National Accelerator Lab where he led two accelerator projects. He led the effort to bring the first high-gradient superconducting RF cavity at Fermilab into operation. Next he designed and performed the first experimental demonstration of a longitudinal-transverse phase space exchange. His thesis won the Rutgers' Professor Plano Thesis Award acknowledging his thesis as the overall best that year. Presently he is PI on an NSF award and Co-PI on a DOE grant, both support research investigating space charge dominated beams at University of Maryland Electron Ring. Dr. Koeth is active in accelerator physics education, he has advised eight graduate students and more than twenty undergraduate students. His educational accelerator program has brought eight students to pursue accelerator physics careers in both industry and academia. His students have been recognized by prestigious awards, most recently two were the recipients of the NSF Graduate Fellowship and one of the Henry Rutgers Scholars Award. Dr. Koeth is an instructor at the United States Particle Accelerator School; he has developed and taught a new course on Cyclotrons & Their Design first held at Duke University in 2013 and an expanded version at Rutgers in 2015. He has incorporated this curriculum into a Capstone Design Program offered at UMD for the first time Spring 2016. As part of the Scientific Program Committee, he was invited to chair the inaugural session on educational cyclotrons at the 2013 International Conference on Cyclotrons and their Applications. Dr. Koeth is currently the Director of the University of Maryland Nuclear Reactor & Radiation Facilities, which includes a panoramic ^{60}Co irradiator, two high power linear accelerators, and the Maryland 250 kW Training Reactor and its newly commissioned neutron radiography facility. He is interested in coupling his experience of cyclotrons and intense charged particle beams with sub-critical piles in the field of Accelerator Driven Systems and in the medical uses of accelerators. He has more than seventy-five scientific publications, has given nearly thirty invited presentations of his work, holds one patent and is involved in collaborations throughout the world.

EXPERIENCE

Associate Research Professor

University of Maryland College Park

College Park, Maryland, July 2016 – present

- Faculty of the Institute for Research in Electronics & Applied Physics
- Affiliate Assistant Research Professor, UMD Department of Physics
- Faculty Member of Chemical Physics Program
- Department of Material Science and Engineering
- Nuclear Engineering
- Member of Graduate School
 - Advising physics PhD student research
 - Developing accelerator physics curriculum
 - High intensity electron beam space charge studies
 - University of Maryland Electron Ring (UMER) operations
 - Investigating non-linear integrable optics for storage rings

Director, Nuclear Reactor & Radiation Facilities

University of Maryland College Park

Department of Materials Science & Engineering,

College Park, Maryland, November 2013 – present

- Supervising nuclear engineering PhD student research
- NRC licensed Senior Reactor Operator (SRO)
- Voting member of Reactor Safety Committee
- Voting member of Radiation Safety Committee
- UMD Nuclear Reactor Operations & Fuel Handling
- MDE licensed 2 to 10 MeV, 1kW Electron LINAC operator
- MDE licensed Panoramic Irradiator Operator
- MDE licensed high activity ^{60}Co source handler

Assistant Research Professor

University of Maryland College Park

College Park, Maryland, July 2012 – June 2016

- Faculty of the Institute for Research in Electronics & Applied Physics
- Affiliate Assistant Research Professor, UMD Department of Physics
- Faculty Member of Chemical Physics Program
- Department of Material Science and Engineering

Visiting Assistant Research Professor

Rutgers University, Department of Physics and Astronomy

Piscataway, New Jersey, March 2015 – present

- Directing research and education on Rutgers' 12-Inch Cyclotron
(www.physics.rutgers.edu/cyclotron)

Associate Director of Radiation Facilities

University of Maryland College Park

University of Maryland Training Reactor (MUTR)

Department of Materials Science & Engineering,

College Park, Maryland, July 2012 – October 2013

- Mentoring nuclear engineering PhD student research
- NRC licensed Senior Reactor Operator (SRO)
- Interim Director of Radiation Facilities
- Voting member of Reactor Safety Committee
- MUTR Nuclear Reactor Operations & Fuel Handling
- Panormaic ^{60}Co Irradiator operations
- 10 MeV LINAC operations

Research Faculty: Assistant Research Scientist

University of Maryland College Park, IREAP,
College Park, Maryland, July 2011 – June 2012

- High intensity electron beam space charge studies
- University of Maryland Electron Ring (UMER) operations
- Developing UMER beam extraction as a multi-turn diagnostic
- Mentoring and recruiting of graduate, undergraduate, and high school students
- Investigating anomalous x-ray production from adhesive manipulation
- Studying electrical discharge phenomena in PMMA

Instructor

United States Particle Accelerator School (USPAS):

Rutgers University, Piscataway, New Jersey, June 2015

- Cyclotron graduate course on design, operation, & measurements

Duke University, Durham, North Carolina, January 2013

- Developed and taught graduate course on cyclotron design

Stony Brook University, Stony Brook, New York, June 2011

- Fundamentals of Accelerator Physics

Guest Scientist

Rutgers University, Department of Physics and Astronomy

Piscataway, New Jersey, January 2011 – February, 2015

- Directing research and education on Rutgers' 12-Inch Cyclotron
- First to image axial betatron motion in a weak focusing magnetic field
- First to develop intentionally driven resonance for demonstration
- Leading 19-Inch Cyclotron design and construction
- Leading miniature ion source development
- Leading Azimuthally Varying Field R&D program
- Developing beam-phase measurement
- Assisted in developing NJ State required safety training

President and Principal Physicist

Cyclotronix, LLC

Flemington, New Jersey, August 2010 - present

- Industrial accelerator component R&D and engineering
- Radiofrequency resonator construction, measurement, & tuning
- Unique accelerator component fabrication
- Clients include: Ionetix, IBA Molecular

Visiting Instructor

Rutgers University, Department of Physics and Astronomy
Piscataway, New Jersey, June 2009 – January 2011

- Developed accelerator physics curriculum for senior level undergraduate physics students
- Directing research and education on Rutgers' 12-Inch Cyclotron
- Cyclotron beam physics, ion source, and extraction studies
- Chair of inaugural Small Cyclotron Conference

Research Associate

University of Maryland College Park, IREAP,
College Park, Maryland, April 2009 – July 2011

- High intensity electron beam space charge studies
- Developed novel DC beam detection diagnostic
- Developed UMER's in situ turn-by-turn transverse imaging diagnostic
- Studying electrical discharge phenomena in PMMA

Accelerator Physics PhD Candidate

Fermi National Accelerator Laboratory (FNAL),
Batavia, Illinois, August 2004 – May 2009

- Design and perform Emittance Exchange Experiment at the A0 Photoinjector
- Electron Beam Line optics utilizing RF cavities (emittance exchange experiment)
- Superconducting 3.9 GHz RF Cavity Development (accelerating and deflecting modes)
- Normal conducting 3.9 GHz Deflecting RF Cavity Development
- Oversaw installation and operation of an TESLA high gradient superconducting cavity at FNAL
- High Power (200kW) RF Input Coupler characterizing and conditioning
- Low Level RF controls, High Level RF power implementation

Graduate Research Assistant, PhD Student

Rutgers University, Department of Physics and Astronomy
Piscataway, New Jersey, September 2002 – July 2004

- EUV Si and GaN detector characterization
- Electrostatic image minification tube R&D
- E x B Photocathode UV Imaging Tube characterization

Engineering Physicist

Rutgers University, Department of Physics and Astronomy
Piscataway, New Jersey, December 1998 – August 2002

- R&D of CVD Diamond particle detectors
- Characterization of diamonds at FNAL and CERN test beams
- LHC's CMS Si/diamond Forward Pixel Detector development
- Design of test beam Particle Detector Tracker assembly

Primary Designer (independent pursuit)

Rutgers University, Department of Physics and Astronomy
Piscataway, New Jersey, January 1998 – May 2009

- Design, construction, and operation of 12-inch, 1.2 MeV research and educational cyclotron
- Incorporation of cyclotron into upper level Modern Physics Lab course
- Magnetic field, RF systems, Ion Source design and improvements
- Axial and radial betatron motion studies

RF Accelerator Engineer

Fermi National Accelerator Laboratory
Batavia, Illinois, March 1998 – December 1998

- Intricate system design decision responsibilities
- Computer aided modeling of radiofrequency structures
- Design and testing of superconducting radiofrequency cavities

Assistant Health Physicist

Rutgers University Radiation, Health and Safety Department
Piscataway, New Jersey, May 1997 – March 1998

- Internal inspection and enforcement of NRC and NJDEP codes and regulations
- Radiation Safety Training instructor
- Design and construction of specialized radiation survey equipment
- Maintenance and Calibration of all university radiological detection equipment

TEACHING

UMD EENE408T *Accelerator Physics - Capstone Design Project*, 3cr,
Spring 2016

UMD ENME432, *Reactor and Radiation Measurements Laboratory*, 3cr
Fall 2015

UMD ENMA432, *Reactor and Radiation Measurements Laboratory*, 3cr
Spring 2015

Rutgers PHYS387/388/389, *Experiments in Modern and Applied Physics*,
3cr, Spring 2001, '02, '03, '04, '09, '10, '11, '12, '13, '14, '15,
emphasizing accelerator physics

Cyclotron Design, Operation, and Measurement, USPAS Summer 2015
Rutgers University, 3cr (graduate level)

Cyclotron Design, USPAS Winter 2013, Duke University, 1.5cr (graduate
level)

Fundamentals of Accelerator Physics, USPAS Summer 2011, Stony
Brook, 2011

FUNDING

PI (100%) – National Science Foundation \$300K, *Non-Linear Beam Optics* (starting July, 2014)

PI (100%) NASA \$150K, May 2016, *NASA Irradiation Experiment*

PI (100%) UMD College of Engineering (Internal) \$115K, June 2016, *Dielectric-Based Energy Storage*

CO-PI (20%): US Department of Energy \$2.4 Million grant: *Accelerator Research Studies*

PATENTS

“*B-K Electrode for fixed frequency particle accelerators*” United States Patent number 8,207,656 (issue date June 26, 2012)

“Proton Therapy Range Modulation and Control” United States Patent Pending (Submitted April 2014)

HONORS & RECOGNITION

- *Physics Today*, featured in BackScatter column, April, 2011
- *symmetrybreaking* article on the “Physics of Scotch Tape,” January 2011
- Richard J. Plano Dissertation Award, [Best Annual Rutgers Physics Ph.D.], April 2010
- Fellowship to attend ILC Workshop awarded by the American Linear Collider Physics Group, July 2006
- *symmetry magazine* article, August 2010, featured Small Cyclotron Conference
- *Make Magazine* article, April 2005, reporting on personally built Cyclotron
- *Physics Today* article, November 2004, featured personally built Cyclotron.
- Selected to represent Rutgers at the Lindau Meeting of Nobel Laureates, July 2004

INVITED TALKS

- Keynote Speaker at Rutgers Physics Graduation Celebration, Rutgers, New Jersey, May 2016
- QuarkNet workshop, Rutgers, New Jersey, July 2015
- American Nuclear Society, DC Chapter, Washington DC, April 2015
- QuarkNet workshop, Rutgers, New Jersey, July 2014
- CAARI Conference, San Antonio, Texas, May 2014
- Physics Colloquium, Houghton College, April 2014
- Old Dominion University – Center for Accelerator Science August 2013
- NIST Center for Neutron Research, Seminar August 2013
- NIST Center for Neutron Research, September 2013
- NIST Center for Neutron Research, June 2013
- Seminar, India’s Inst. of Technology (via internet), January 2013.
- Seminar, Los Alamos National Laboratory, November 2012
- Seminar, CIEMAT, Madrid Spain, November 2011
- Seminar, DITANET, CNT, Seville, Spain, November 2011

- Seminar Lawrence Berkeley Laboratory, October 2011
- Seminar Princeton Plasma Physics Laboratory, October 2011
- Seminar at the Center for Beam Physics (CBP),
Lawrence Berkeley National Lab, May, 2011
- Seminar, Code for America, San Francisco, April, 2011
- Particle Accelerator Conference, New York, March 2011
- Instructional seminar, DITANET, Stockholm, March 2011
- Seminar at NSCL, Michigan State University, November, 2010
- Joint Julian Schwinger Foundation Workshop, Singapore, August 2010
- Keynote speaker at the Small Cyclotron Conference dinner, New York
April, 2010
- Lecturer at DARPA DSRC meeting, Virginia, March 2010
- MIT Daedalus Workshop, Boston Massachusetts, February 2010
- Plasma Physics Seminar, IREAP, University of Maryland
September 2009
- Plenary presentation, Linear Accelerator Conference, Vancouver,
October 2008
- Keynote speaker at Rutgers Physics Annual Awards Banquet, April 2008
- Fermilab's all experimenters meeting, June 2006
- Plenary Presentation at Annual Fermilab Users Meeting, May 2006
- Fermilab's Budker Seminar, April 2006
- Fermilab, annual QuarkNet Meeting, April 2006

CONTRIBUTED TALKS

- Directed Energy Professional Society Symposium, La Jolla CA, 2011
- Advanced Accelerator Concepts Workshop, Annapolis MD, 2010
- Small Cyclotron Conference, Houghton, New York, April, 2010
- High Brightness Electron Beam Workshop, Hawaii, November 2009

SERVICE

- Review Panel Member, DOE NP Accelerator R&D, May 2016
- Scientific Program Committee Member of North American Particle
Accelerator Conference (NAPAC) 2016
- Department of Energy SBIR reviewer selection panel, 2016 & 2015
- Member of NIST's National Bureau of Standards Reactor Safety
Advisory oversight Committee
- Review of Penn State's Nuclear Reactor Program, December 2013
- Scientific Program Committee Member of 20th International Conference
on Cyclotrons and Their Applications 2013
(Chair of inaugural *Educational Cyclotron* session)
- Scientific Program Committee Member of Particle Accelerator
Conference (PAC) 2011
- Chair of inaugural Small Cyclotron Conference, Houghton College
New York, April 2010
- Reviewer of Department of Energy HEP grant reviewer
- Reviewer of Department of Energy STTR Proposal, November 2012
- Article Reviewer, *Nuclear Instruments and Methods A*, September 2012
- Article Reviewer, *Physical Review ST-AB*, July 2012
- Reviewer of Department of Energy SBIR Proposal, November 2011

- Reviewer of Department of Energy STTR Proposal, November 2011
- Reviewer, Plasma Sources Science and Technology, October 2011
- Reviewer of Department of Energy SBIR Phase II Proposal, May 2011
- Reviewer of Department of Energy SBIR/STTR Proposal, January 2011
- Article Reviewer, *Physical Review Letters*, January 2010
- Article Reviewer, *Physical Review Special Topics: Accelerators and Beams*, October 2009
- Reviewer of two Department of Energy SBIR/STTR Proposals February 2010

GRADUATE STUDENT ADVISING

1. Ph.D. Advisor of Slavica Grdanovska, January 2013 – December 2015
“Photonic band gap structure for in-situ nuclear reactor core monitoring.” – PhD granted December 2015 (employed at Notre Dame, South Bend, Indiana)
2. Ph.D. Advisor of Kiersten Ruisard, June 2012 – present
“Developing Highly Non-Linear Beam Optics towards enabling the Intensity Frontier” – anticipated May 2017
(*Ruisard was the recipient of the NSF Graduate Fellowship to study non-linear beam optics in 2014*)
3. Ph.D. Advisor of Will Stem, July 2011 – June 2015
“Characterizing space charge dominated beam envelope resonances.” – PhD granted May 2015 (employed at GSI, Darmstadt, Berlin Germany)
4. Ph.D. Committee member of Chanel Tissot, January 2013 – Dec 2015
“Uranium from Seawater.” – PhD granted Dec 2014 (employed at FDA)
5. M.S. Advisor of Jason M. Osheroff, January 2013 – present, “USPAS Accelerator Physics”
6. Ph.D. Co-Advisor of Amy E. Beasten, September 2012 – May 2013.
“Neutron Detection in BF₃ and Noble Gas Excimer Radiation in the Far UV.” – PhD granted May 2013 (employed at NRC)
7. M.S. Advisor of Masters Student, Eric Vorheis, 2010-2011
“Design of an electrostatic based electron beam energy analyzer for UMER.” MS granted 2011

OTHER STUDENT ADVISING

1. Senior Thesis Advisor of Claudia Richoux, TJHSST-IREAP May 2015
Mentorship Program. “Conversation of the Rutgers 12-Inch Cyclotron to a Synchrocyclotron” August 2015 – February 2016.
2. Summer Internship Research Advisor of John Lathrop, May 2015 – August 2015 “High resolution spectroscopy of electron beam induce gamma rays”
3. Undergraduate Research Advisor of David B. Matthew (Physics), May 2015 – present. “Design, modeling, and commission of octupole electromagnet for non-linear beam optics at UMER” –

graduation anticipated December 2016

4. Instructor of Rutgers' Cyclotron students Dennis Grabowski, Matthew Teperman, Luke Nelson, Spring 2015, "Optimization of the ion source and central region in the Rutgers 12-Inch Cyclotron"
5. Instructor of Rutgers' Cyclotron students Craig Reingold, Lutz Leopold, Darren Moreno, Spring 2014, "Design and commissioning of $^{19}\text{F}(p, \alpha)^{16}\text{O}$ " nuclear reaction experiment with the Rutgers 12-Inch Cyclotron
6. Instructor of Rutgers' Cyclotron students Julia Gonski, Sean Burcher, Stoyan Lazarov, Spring 2013, "Novel Optical Method for Measuring Beam Phase and Width in the Rutgers 12-Inch Cyclotron" (*Gonski was the recipient of the NSF Graduate Fellowship to study High Energy Physics in 2014*)
7. Senior Thesis advisor of Rutgers' Physics student Kiersten Ruisard, May 2011 – June 2012, "Modeling and design of an extraction beam line for the University of Maryland Electron Ring." (*Ruisard's work awarded prestigious Henry Rutgers Scholars Award, 1 of only 40 awards out of approximately 40,000 Rutgers students*) (at UMD)
8. Research Advisor of Jason Osheroff, UMD UMER undergraduate summer intern, summer 2012, UMER *in situ* transverse imaging and longitudinal energy analyzer diagnostics upgrade.
9. Research Advisor of Carl O'Donnell, UMD UMER undergraduate summer intern, summer 2012, Design and testing of high-current water cooled flexible printed circuit based magnets for UMER extraction upgrade.
10. Research Advisor of Jacob Butcher, UMD UMER undergraduate summer intern, summer 2012, mechanical design and modeling of multiple UMER extraction sections.
11. Senior Thesis Advisor of Mephare Atay, Rutgers Physics Undergraduate Independent study in physics, summer 2012, Simulations for Cyclotron Central Region Optimization
12. Instructor of Rutgers' Cyclotron students, Kiersten Ruisard, George Hine, Aaron Rosenberg, Spring 2011, "Design and installation of AVF pole tips for the 12-inch Cyclotron"
13. Instructor of Rutgers' Cyclotron student, Timothy Ponter, Fall 2010. A 3D simulation study of ion orbits in an AVF magnetic field of the Rutgers 12-Inch Cyclotron
14. Mentor of UMD PhD student, Yichao Mo, Fall 2010. Development of a quasi non-destructive phosphor wire transverse beam diagnostic for UMER
15. Research Advisor of Claire Stortstrom, UMD undergraduate summer intern, Study of discharge characteristics during the formation of a Lichtenberg Figure, summer 2010
16. Research Advisor of Timothy Ponter, UMD UMER undergraduate summer intern, summer 2010, Electrical upgrade to UMER's DC

quadrupole system

17. Mentor of UMD undergraduate student, Albert Tioga, summer 2010.
Electrical upgrade to UMER's DC quadrupole system
18. Instructor of Rutgers' Cyclotron student, Timothy Ponter, Spring 2010
Design of a miniature cold-cathode P.I.G. ion source.
19. Research Advisor of Timothy Ponter, UMD UMER undergraduate
summer intern, summer 2009, Design of a pneumatic actuated
diagnostic chamber for UMER
20. Scientific Mentor of High School Student, Heidi Baumgartner's
New York City Science Fair project, academic year 2009-10
21. Scientific Mentor for Jlab's 'Cyclotron Kids' - high school students,
Construction of a 15-Inch cyclotron, 2008-present
22. Instructor of Rutgers' Cyclotron student, Timothy Ponter, Spring
2009, The design, construction, and commissioning of an
electrostatic deflector to measure cyclotron beam energy
23. Instructor of Rutgers' Cyclotron students, Rob Friedman and John
McClain, Spring 2003, Profiling the magnetic field of a
new pole tip design on the Rutgers 12-Inch Cyclotron
24. Instructor of Rutgers' Cyclotron students, Carolyn Chun and Liam
MacLynne, Spring 2002. A new pole tip design to promote beam
focusing in the Rutgers 12-Inch Cyclotron
25. Instructor of Rutgers' Cyclotron student, Kent Horvath, Spring 2001.
A study of ion orbits in the Rutgers 12-Inch Cyclotron

CONSULTING

- L&W Research, Dr. Paul Leek, January 2014 - present
Nature of work: accelerator technology
- Massachusetts Institute of Technology, March – July 2011
Nature of work: cyclotron expert
- Jefferson National Lab, Dr. Andrew Hutton, January 2010 to present
Nature of work: Cyclotron expert for the 'Cyclotron Kids' project
- Applied Plasmonics, Gainesville FL, Dr. Jonathan Gorrell,
November 2007 to January 2009, Nature of work: Guiding
miniature cyclotron development
- Princeton University, Prof. Frank Calaprice, January 2009 to May 2009
Nature of work: 4D E&M simulations of photoelectron based UV
detector
- Environmetrics, Princeton NJ, Dr. Phil Eftimion,
September 2007 to April 2008, Nature of work: Plasma filled RF
cavity simulations

AFFILIATIONS

Fermi National Accelerator Laboratory – *Visitor* status
Thomas Jefferson National Accelerator Facility – *User* status
Lawrence Berkeley National Laboratory – *Affiliate* status
National Institute for Standards and Technology – *Guest Researcher* status

RECREATION

Amateur Radio: FCC Extra Class license KØETH (formerly N2LPN)

American Radio Relay League certified Volunteer Examiner (VE)
High-Resolution HPGe based gamma ray spectroscopy
Restoration of antique Tektronix oscilloscopes

PUBLICATIONS

REFEREED

1. **Invited** “**Long-path-length experimental studies of longitudinal phenomena in intense beams,**” B. Beaudoin, I. Haber, R. A. Kishek, S. Bernal, T.W. Koeth, *Physics of Plasmas*, Accepted January 2016
2. “**Demonstration of Neutron Detection Utilizing open Cell Foam and Noble Gas Scintillation,**” C.M Lavelle, M. Coplan, E.C. Miller, A.K. Thompson, A.L. Kowler, R.E. Vest, A.T. Yue, T.W. Koeth, M. Al-Sheikhly, C.W. Clark, *Applied Physics Letters*, **106**, 094103 (2015)
3. **Invited:** “**Undergraduate Education with the Rutgers 12-Inch Cyclotron,**” Timothy W. Koeth, CAARI2014, *Physics Procedia*, Volume 66, June 2015, Pages 622-631, <http://www.sciencedirect.com/science/article/pii/S1875389215002369>
4. **Invited:** “**Modeling HIF relevant longitudinal dynamics in UMER,**” B. Beaudoin, S. Bernal, C. Blanco, I. Haber, R.A. Kishek, T. Koeth, and Y. Mo, *Nuclear Instruments and Methods A*, **733**, 178-181, 2014
5. **Invited:** “**The University of Maryland Electron Ring program,**” R.A. Kishek, B. Beaudoin, S. Bernal, M. Cornacchia, D. Feldman, R. Fiorito, I. Haber, T. Koeth, Y. Mo, P.G. O'Shea, K. Poor Rezaei, D. Sutter, and H. Zhang, *Nuclear Instruments and Methods A*, **733**, 233-237, 2014
6. “**Smooth Approximation model of dispersion with strong space charge for continuous beams,**” S. Bernal, B. Beaudoin, T. Koeth, P. G. O'Shea, *Physical Review Special Topics - Accelerators & Beams*, **14**, 104202, 2011
7. “**First observation of the exchange of transverse and longitudinal emittances,**” J. Ruan, A. H. Lumpkin, A. S. Johnson, R. Thurman-Keup, H. Edwards, R.P. Fliller, T. W. Koeth, and Y.-E. Sun, *Phys. Rev. Lett.*, **106**, 2011
8. “**Superconducting cavity driving with FPGA controller,**” T. Czarski, W. Koprek, K. T. Pozniak, R. S. Romaniuk, S. Simrock, A. Brandt, B. Chase, R. Carcagno, G. Cancelo, T. Koeth, *Nuclear Instruments and Meth A*, **568**, 854-862, 2006
9. “**Demonstration of 4H-SiC visible-blind EUV and UV detector with large detection area,**” X. Xin, F. Yan, T. W. Koeth, C. Joseph, J. Hu, J. Wu, J.H. Zhao, *Electronic Letters*, **41**, 21, October 2005
10. “**The effect of highly ionizing particles on the CMS silicon strip tracker**” W. Adam *et al.* *Nuclear Instruments and Methods in Physics Research Section A*, **543**, Issues 2–3, 463-482, 11 May 2005,

11. **“New results on diamond pixel sensors using Atlas frontend electronics,”** M. Keil *et al.* 2003. Prepared for 10th International Workshop on Vertex Detectors (Vertex 2001), Brunnen, Switzerland, 23-28 Sep 2001. *Nuclear Instruments and Methods A*, **501**, 153-159, 2003
12. **“Status of the R&D activity on diamond particle detectors,”** W. Adam *et al.* 2003. 8pp. Prepared for 11th International Workshop on Vertex Detectors (Vertex 2002), Kona, Kailua, Hawaii, 3-8 Nov 2002. *Nuclear Instruments and Methods A*, **511**, 124-131, 2003
13. **“CVD diamond pixel development”** R. Stone, *et al.* 2002. Prepared for IEEE 2001 Nuclear Science Symposium (NSS) and Medical Imaging Conference (MIC), San Diego, California, 4-10 Nov 2001, *IEEE Trans. Nuclear Science*, **49**, 1059-1062, 2002
14. **“Beam test results of the US-CMS forward pixel detector,”** M. Atac *et al.* FERMILAB-PUB-02-187, Aug 2002. 11pp. *Nuclear Instruments and Methods A*, **488**, 271-281, 2002
15. **“The development of diamond tracking detectors for the LHC,”** RD42 Collaboration, W. Adam *et al.*, 2003. 8pp. Prepared for 4th International Conference on Radiation Effects on Semiconductor Materials Detectors and Devices (RESMDD02), Florence, Italy, 10-12 Jul 2002. *Nuclear Instruments and Methods A*, **514**, 79-86, 2003
16. **“Radiation tolerance of CVD diamond detectors for pions and protons,”** W. Adam *et al.* *Nuclear Instruments and Methods A*, **476**, Issue 3, 686-693, 11 January 2002
17. **“Performance of irradiated CVD diamond micro-strip sensors,”** W. Adam *et al.* *Nuclear Instruments and Methods A*, **476**, Issue 3, 11 January 2002, Pages 706-712
18. **“Diamond Pixel Detectors,”** Adam, *et al.* *Nuclear Instruments and Methods A*, **465**, Issue 1, 1 June 2001, Pages 88-91
19. **“Micro-strip sensors based on CVD diamond”** Adam, *et al.* *Nuclear Instruments and Methods A*, **453**, Issues 1–2, 141-148, 11 October 2000

CONFERENCES & NON-REFEREED JOURNALS

20. **“Simulations and experiments in Support of Octupole Lattice Studies at the University of Maryland Electron Ring,”** K.J. Ruisard, B. Beaudoin, I. Haber, T.W. Koeth, International Particle Accelerator Conference 2015, Proceedings MOPMA046, Richmond, VA
21. **“Novel High Power Sources for the Physics of Ionospheric Modification,”** B. Beaudoin, T.M. Antonsen, I. Haber, T.W. Koeth, A.H. Narayan, G.S. Nusinovich, K.J. Ruisard, J. Rodgers, International Particle Accelerator Conference 2015, Proceedings WEPTY056, Richmond, VA
22. **“Nonlinear Optics at the University of Maryland Electron Ring”** K.J. Ruisard, I. Haber, R.A. Kishek, T.W. Koeth, Advanced Accelerator Concepts 2014, Proceedings, San Jose, CA, submitted July 2014

23. **“Nonlinear Dynamics with Space-Charge in a Small Electron Recirculator”** S. Bernal, D. Sutter, B. Beaudoin, I. Haber, T.W. Koeth, Y. Mo, E. Montgomery, K.P. Rezaei, K. Ruisard, W. Stem, H. Zhang, R.A. Kishek, Advanced Accelerator Concepts 2014, Proceedings, San Jose, CA, submitted July 2014
24. **Invited: “The Rutgers Cyclotron: Placing Students Careers on Target”** Kiersten J. Ruisard, George Hine, Timothy W. Koeth, Aaron Rosenberg, WE1PB02, Proc. 20th International Conference on Cyclotrons and Their Applications, September 2013, Vancouver, Canada
25. **“A Novel Optical Method for Measuring Beam Phase and Width in the Rutgers 12-Inch Cyclotron” (Contributed Oral)** Julia Lynne Gonski, Brian Beaudoin, Sean Burcher, Timothy Koeth, WE1PB04, Proc. 20th International Conference on Cyclotrons and Their Applications, September 2013, Vancouver, Canada
26. **“Beam Physics Demonstrations with the Rutgers 12-Inch Cyclotron”** Timothy W. Koeth, WEPPT025, Proc. 20th International Conference on Cyclotrons and Their Applications, September 2013, Vancouver, Canada
27. **“The Rutgers 12-Inch Cyclotron: Dedicated to Training Through R&D”** Timothy W. Koeth, WEPPT024, Proc. 20th International Conference on Cyclotrons and Their Applications, September 2013, Vancouver, Canada
28. **“Experimental Observations of a Multi-stream Instability in a Long Intense Beam,”** B.L. Beaudoin, I. Haber, R.A. Kishek, and T. Koeth, Proceedings of the 2013 International Particle Accelerator Conference, Shanghai, China, WEOAB103, 2013
29. **“Design and Simulation of an Extraction Section for the University of Maryland Electron Ring,”** K.J. Ruisard, S. Bernal, I. Haber, R.A. Kishek, and T. Koeth, Proceedings of the 2013 International Particle Accelerator Conference, Shanghai, China, 2013
30. **“Measurement of the Transverse Dependence of the Coherent Betatron Tune Shift in the Electron Storage Ring UMER,”** David Sutter, B.L. Beaudoin, S. Bernal, M. Cornacchia, and T. Koeth, Proceedings of the 2012 International Particle Accelerator Conference, New Orleans, LA, USA, May 2012, Paper ID WEPPR016, May 2012
31. **“Envelope Perturbations in a Space-charge-dominated Electron Beam,”** W. Stem, I. Haber, R.A. Kishek, and T. Koeth, Proceedings of the 2013 International Particle Accelerator Conference, Shanghai, China, 2013
32. **Invited: “Longitudinal Space Charge Phenomena in an Intense Beam in a Ring,”** R.A. Kishek, B. Beaudoin, I. Haber, D. Feldman, T. Koeth, and Y. Mo, Proceedings of the 52nd ICFA Advanced Beam Dynamics Workshop on High-Intensity and High-Brightness Hadron Beams, Beijing, China, Sep 2012, Paper ID, WEO1C05, 2012
33. **“Experimental and Simulation Study of the Long-path-length Dynamics of a Space-charge-dominated Bunch,”** I. Haber, B.L. Beaudoin, S. Bernal, R.A. Kishek, T. Koeth, and

Y.C. Mo, Proceedings of the 2012 Linear Accelerator Conference, Tel Aviv, Israel, Sep 2012, Paper ID, THPB061, 2012

34. **“Design of an Electrostatic Extraction Section for the University of Maryland Electron Ring”** K. J. Ruisard, B.L. Beaudoin, I. Haber, R. A. Kishek, T. W. Koeth, Proc. 2012 International Particle Accelerator Conference, New Orleans, LA, Paper ID WEPPR013, May 2012

35. **“Recovering Measured Dynamics from a DC Circulating Space Charge Dominated Storage Ring”** W.D. Stem, B. L. Beaudoin, I. Haber, T. W. Koeth, Proc. 2012 International Particle Accelerator Conference, New Orleans, LA, Paper ID WEPPR014, May 2012

36. **Invited: “Longitudinal Relaxation of a Space-Charge Dominate Bunch”** T. W. Koeth, B.L. Beaudoin, S. Bernal, I. Haber, R.A. Kishek, M. Reiser, and P.G. O'Shea, Proceedings of the 2011 IEEE Particle Accelerator Conference, New York, New York, Paper ID, MOOB53, March 2011

37. **“Space-Charge Effects in Bunched and Debunched Beams”** B.L. Beaudoin, S. Bernal, K. Fiuza, I. Haber, R.A. Kishek, T. W. Koeth, M. Reiser, D. Sutter, and P.G. O'Shea, Proceedings of the 2011 IEEE Particle Accelerator Conference, New York, New York, Paper ID, MOOD51, March 2011

38. **“Smooth Approximation of Dispersion with Strong Space Charge”** S. Bernal, B.L. Beaudoin, T. W. Koeth, and P.G. O'Shea, Proceedings of the 2011 IEEE Particle Accelerator Conference, New York, New York, Paper ID, WEP101, March 2011

39. **“Advances in Modeling the University of Maryland Electron Ring”** R.A. Kishek, B.L. Beaudoin, S. Bernal, M. Cornacchia, K. Fiuza, I. Haber, T. W. Koeth, P.G. O'Shea, D. Sutter, and H. Zhang, Proceedings of the 2011 IEEE Particle Accelerator Conference, New York, New York, Paper ID, WEP050, March 2011

40. **“Current Dependent Tune Shifts in the University of Maryland Electron Ring”** D. Sutter, B.L. Beaudoin, S. Bernal, M. Cornacchia, R.A. Kishek, T. W. Koeth, P.G. O'Shea, and M. Reiser, Proceedings of the 2011 IEEE Particle Accelerator Conference, New York, New York, Paper ID, WEP102, March 2011

41. **“Design of a Compact, High-Resolution Analyzer for longitudinal Studies in the University of Maryland Electron Ring”** E. Voorhies, R.A. Kishek, T. W. Koeth, P.G. O'Shea, and I. Haber, Proceedings of the 2011 IEEE Particle Accelerator Conference, New York, New York, Paper ID, MOP243, March 2011

42. **“High Intensity Beam Physics at UMER”** B.L. Beaudoin, S. Bernal, M. Cornacchia, K. Fiuza, I. Haber, R.A. Kishek, T.W. Koeth, M. Reiser, D.F. Sutter, H. Zhang, and P.G. O'Shea, Proceedings of the 46th ICFA Advanced Beam Dynamics Workshop on High-Intensity, High-Brightness Hadron Beams, Morschach, Switzerland, September 2010

43. **“Measurement & Simulation of Interpenetration and DC Accumulation in the University of Maryland Electron Ring”** Timothy W. Koeth, Brian Beaudoin, S. Bernal, I. Haber, R.A. Kishek, M. Reiser, and P.G. O'Shea, Proceedings of 14th Workshop on Advanced Accelerator Concepts (AAC), Annapolis, MD, June 2010, New York: AIP Press, 2010
44. **“Transverse Beam Physics in UMER – Update”** S. Bernal, D. Sutter, B. Beaudoin, M. Cornacchia, K. Fiuza, I. Haber, R.A. Kishek, T. Koeth, M. Reiser, and P.G. O'Shea, Proceedings of 14th Workshop on Advanced Accelerator Concepts (AAC), Annapolis, MD, June 2010, New York: AIP Press, 2010
45. **“Longitudinal Confinement of an Intense Beam Using Induction Focusing”** B.L. Beaudoin, S. Bernal, I. Haber, R.A. Kishek, T. Koeth, D. Sutter, and P.G. O'Shea, Proceedings of 14th Workshop on Advanced Accelerator Concepts (AAC), Annapolis, MD, June 2010, New York: AIP Press, 2010
46. **“Demonstration of Transverse-to-longitudinal emittance exchange at the Fermilab Photoinjector”** A. Johnson, J. Ruan, H. Edwards, T. Koeth, A. Lumpkin, P. Piot, J. Santucci, Y.-E. Sun, R. Thurman-Keup, Proceedings of IPAC'10, Kyoto, Japan, 2010
47. **“Longitudinal Focusing Studies for Heavy Ion Inertial Fusion”** B. Beaudoin, S. Bernal, K. Fiuza, I. Haber, R.A. Kishek, T. Koeth, P.G. O'Shea, M. Reiser, D. Sutter, and J.C.T. Thangaraj, Sixth International Conference on Inertial Fusion Sciences and Applications, San Francisco, September 2009
48. **“Resonance Phenomena over a Broad Range of Beam Intensities”** S. Bernal, B. Beaudoin, T. Koeth, M. Cornacchia, D. Sutter, K. Fiuza, I. Haber, R. A. Kishek, C. Wu, C. Papadopoulos, M. Reiser, and P. G. O'Shea, Proceedings of the 2009 Particle Accelerator Conference, Vancouver, British Columbia, Canada, 2009
49. **Invited: “Emittance Exchange Results”** R. P. Fliller III, T. W. Koeth, Proceedings of the 2009 Particle Accelerator Conference, Vancouver, British Columbia, Canada, 2009
50. **“Emittance Exchange at the Fermilab A0 Photoinjector”** T. W. Koeth, H. Edwards, R. P. Fliller III, A. H. Lumpkin, A. S. Johnson, R. Thurman-Keup, Proceedings of the 2009 Particle Accelerator Conference, Vancouver, British Columbia, Canada, 2009
51. **“Bunch Length Measurements at the A0 Photoinjector Using a Quasi-Optical Schottky Detector”** G.M. Kazakevich, M.A. Davidsaver, H.T. Edwards, R.P. Fliller, T.W. Koeth, A.H. Lumpkin, S. Nagaitsev, J. Ruan, R. Thurman-Keup, Y.U. Jeong, V.V. Kubarev, Proceedings of the 2009 Particle Accelerator Conference, Vancouver, British Columbia, Canada, 2009
52. **“Emittance Exchange at the Fermilab A0 Photoinjector”** T. W. Koeth, H. Edwards, R. P. Fliller III, A. H. Lumpkin, R. Thurman-Keup, Proceedings of the 2008 Linear Accelerator Conference, Victoria, British Columbia, Canada, 2009

53. **“Initial Commissioning of a Dual-Sweep Streak Camera on the A0 Photoinjector”**
A.H. Lumpkin, T.W. Koeth, J. Ruan, Proceedings of the 2008 Linear Accelerator Conference, Victoria, British Columbia, Canada, 2008
54. **“Statues of the Tranverse to Longitudinal Emittance Exchange at the A0 Photoinjector”** T. W. Koeth, L. Bellantoni, D.A. Edwards, H. Edwards, R. P. Fliller III, G. Kazakevich, Proceedings of the 2008 European Particle Accelerator Conference, Magazzini del Cotone, Genoa, Italy, 2008
55. **“Start to End Simulation of Transverse to Longitudinal Emittance Exchange at the A0 Photoinjector”** R.P. Fliller III, H. Edwards, J. Ruan, T. W. Koeth, Proceedings of the 2008 European Particle Accelerator Conference, Magazzini del Cotone, Genoa, Italy, 2008
56. **“Investigation of Possible CSR Induced Energy Spread Effects with the A0 Photoinjector Bunch Compressor”** R. P. Fliller, T. W. Koeth, H. T. Edwards, G. M. Kazakevich, J. Ruan, R. Thurman-Keup, Proceedings of the 2008 European Particle Accelerator Conference, Magazzini del Cotone, Genoa, Italy
57. **“ECR Plasma Cleaning” An in-situ Processing Technique for RF Cavities** G. Wu, W-D. Moeller, C. Antoine, H. Jiang, I. Pechenezhskiy, L. Cooley, T. Khabiboulline, Y. Terechkine, H. Edwards, T. Koeth, A. Romanenko, A. Wu, *FERMILAB-PUB-08-005-TD, Jan 2008. 10pp.*
58. **“Transverse to Longitudinal Emittance Exchange Beamline at the A0 Photoinjector”** R.P. Fliller, H. Edwards, T. Koeth, K. Harkey, K.J. Kim, Proceedings of the 2007 Particle Accelerator Conference, Albuquerque, NM.
59. **“A TM110 Cavity for Longitudinal to Transverse Emittance Exchange”** T.W. Koeth, L. Bellantoni, H. Edwards, R. P. Fliller, Proceedings of the 2007 Particle Accelerator Conference, Albuquerque, NM.
60. **“Experience with Capture Cavity II”** T.W. Koeth, H. Edwards, R. P. Fliller, E. R. Harms, A. Hocker, M. McGee, Y. Pischnalnikov, P. Prieto, J. Reid, Proceedings of the 2007 Particle Accelerator Conference, Albuquerque, NM.
61. **“Capture Cavity II Results at FNAL”** J. Branlard, G. I. Canelo, R. H. Carcagno, B. Chase, H. Edwards, R. P. Fliller, B. M. Hanna, E. R. Harms, A. Hocker, T. Koeth, M. Kucera, A. Makulski, U. Mavric, M. McGee, A. Paytyan, Y. Pischnalnikov, P. Prieto, R. Rechenmacher, J. Reid, K. R. Treptow, N. Wilcer, T. Zmuda, Proceedings of the 2007 Particle Accelerator Conference, Albuquerque, NM.
62. **“Emittance Exchange at the Fermilab NICADD Photoinjector”** T. Koeth, R. Andrews, D. Edwards, H. Edwards, R.P. Fliller III, M.J. Syphers, LINAC-06-TUP092, May 2006 3pp. Proceedings in the 2006 LINAC Conference, Knoxville, Tennessee, 21-25 August 2006.
63. **“Capture Cavity II at FNAL”** T. Koeth, R.H. Carcagno, B. Chase, P. Czarapata, H. Edwards, R.P. Fliller III, C. Ginsburg, B.M. Hanna, A. Hocker, A. Klebaner, M. Kucera, M.

McGee, D. Orris, P. Prieto, J. Reid, J. Santucci, W. Soyars, C-Y. Tan. LINAC-06-THP060, May 2006 3pp. Proceedings in the 2006 LINAC Conference, Knoxville, Tennessee, 21-25 August 2006.

64. **“Status of 3.9 GHz Deflecting Mode (Crab) Cavity R&D”** L. Bellantoni, H. Edwards, M. Foley, T. K. Khabiboulline, T. W. Koeth, D. V. Mitchell, A. M. Rowe, N. Solyak, C. Adolphsen, G. Burt, A. C. Dexter, P. Goudket, LINAC-06-THP046, May 2006 p. 682. Proceedings in the 2006 LINAC Conference, Knoxville, Tennessee, 21-25 August 2006.

65. **“Upgrade of the Fermilab/NICADD Photoinjector Laboratory”** P. Piot, H. Edwards, M. Huning, J. Li, R. Tikhoplav, T. Koeth, FERMILAB-CONF-05-174-AD, PAC-2005-TPPE044, May 2005. 3pp. Proceedings in the Particle Accelerator Conference (PAC 05), Knoxville, Tennessee, 16-20 May 2005. Knoxville 2005, Particle Accelerator Conference 2848

66. **“New Developments in CVD Diamond for Detector Applications”** By RD42 Collaboration (W. Adam *et al.*). 2004. Prepared for International Europhysics Conference on High-Energy Physics (HEP 2003), Aachen, Germany, 17-23 Jul 2003. **Eur.Phys.J.C33:S1014-S1016,2004**

67. **“Development of the Diamond Tracking Detectors for High Luminosity Experiments at the LHC”** By RD42 Collaboration (W. Adam *et al.*), CERN-LHCC-2000-011, Jan 2000

68. **“Performance of Irradiated CDV Micro-Strip Sensors”** By RD42 Collaboration (w. Adam *et al.*) CERN-EP-2000-115, Aug 2000

69. **“Micro-Strip Sensors based on CVD Diamond”** By RD42 Collaboration (w. Adam *et al.*) CERN-EP-2000-041, Mar 2000

70. **“Superconducting RF Cavity R&D for a Separated Kaon Beam at Fermilab”** T. Koeth, IEEE Proceedings of the 1999 Particle Accelerator Conference (PAC), 1999

71. **“An RF Separated Kaon beam from the Main Injektor: Superconducting Aspects”** J.D. Fuerst *et al.* FERMILAB-TM-2060, Nov 1998

72. **“An Experimental Program to Study CP Violation and Search for CPT Violation in the K(L) ---> K(S) System”** C. Bhat, *et al.* FERMILAB-P-0894, Apr 1998

TECHNICAL NOTES

73. **“Comparison of azimuthally varying with constant gradient magnetic field with the Rutgers 12-Inch Cyclotron”** Timothy W. Koeth, George A. Hine, Daniel E. Hoffman, James E. Krutzler, Timothy. S. Ponter, Aaron J. Rosenberg, June 2011, available at http://www.physics.rutgers.edu/cyclotron/papers/AVF_study_Dec_31_2011.pdf

74. **“Rutgers 12-Inch Cyclotron electrostatic deflector”** Timothy W. Koeth, Timothy. S. Ponter, Daniel E. Hoffman, William S. Schneider, James E. Krutzler, September 2010, available at http://www.physics.rutgers.edu/cyclotron/papers/Deflector_Nov_23_2010_2.pdf
75. **“Rutgers 12-Inch Cyclotron Ion Source Studies: Part II (Ion Source Simulations and Measurements),”** Timothy W. Koeth, Stuart C. Hanebuth, Daniel E. Hoffman, William S. Schneider, December 2007, available at http://www.physics.rutgers.edu/cyclotron/papers/IonSourceStudiesII_march_26_2008.pdf
76. **“Observation of betatron motion in the Rutgers 12-Inch Cyclotron,”** Timothy W. Koeth, Stuart C. Hanebuth, Daniel E. Hoffman, William S. Schneider, April 2006, available at http://www.physics.rutgers.edu/cyclotron/papers/Betatron_Studies.pdf
77. **“Rutgers 12-Inch Cyclotron ion source studies: Part I,”** Timothy W. Koeth, March 2006, available at http://www.physics.rutgers.edu/cyclotron/papers/ion_source_studies_part_1.pdf
78. **“Theoretical calculations and measurements on the DEE voltage in the Rutgers 12-Inch Cyclotron,”** Timothy W. Koeth, September 2005, available at http://www.physics.rutgers.edu/cyclotron/papers/12_inch_dee_voltage.pdf
79. **“Report on the 12-Inch cyclotron magnet study: measurements, modeling, and future plans,”** Timothy W. Koeth, April 2005, available at http://www.physics.rutgers.edu/cyclotron/papers/12_inch_magnet_studies_4.pdf
80. **“The construction and operation of a nine inch cyclotron,”** Timothy W. Koeth, September 1999